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**METHOD AND APPARATUS FOR PRINTING DOCUMENTS USING A  
DOCUMENT REPOSITORY IN A DISTRIBUTED DATA PROCESSING  
SYSTEM**

**BACKGROUND OF THE INVENTION**

5   **1. Technical Field:**

          The present invention relates generally to an  
improved data processing system and in particular to a  
method and apparatus for managing documents. Still more  
particularly, the present invention provides a method,  
10   apparatus, and computer instructions for managing the  
printing of documents in a distributed data processing  
system.

**2. Description of Related Art:**

          The Internet, also referred to as an "internetwork",  
15   is a set of computer networks, possibly dissimilar, joined  
together by means of gateways that handle data transfer  
and the conversion of messages from a protocol of the  
sending network to a protocol used by the receiving  
network. When capitalized, the term "Internet" refers to  
20   the collection of networks and gateways that use the  
TCP/IP suite of protocols.

          The Internet has become a cultural fixture as a  
source of both information and entertainment. Many  
businesses are creating Internet sites as an integral part  
25   of their marketing efforts, informing consumers of the  
products or services offered by the business or providing  
other information seeking to engender brand loyalty. Many  
federal, state, and local government agencies are also  
employing Internet sites for informational purposes,

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particularly agencies which must interact with virtually all segments of society such as the Internal Revenue Service and secretaries of state. Providing informational guides and/or searchable databases of online public records may reduce operating costs.

Currently, the most commonly employed method of transferring data over the Internet is to employ the World Wide Web environment, also called simply "the Web". Other Internet resources exist for transferring information, such as File Transfer Protocol (FTP) and Gopher, but have not achieved the popularity of the Web. In the Web environment, servers and clients effect data transaction using the Hypertext Transfer Protocol (HTTP), a known protocol for handling the transfer of various data files (e.g., text, still graphic images, audio, motion video, etc.). The information in various data files is formatted for presentation to a user by a standard page description language, the Hypertext Markup Language (HTML). In addition to basic presentation formatting, HTML allows developers to specify "links" to other Web resources identified by a Uniform Resource Locator (URL). A URL is a special syntax identifier defining a communications path to specific information. Each logical block of information accessible to a client, called a "page" or a "Web page", is identified by a URL. The URL provides a universal, consistent method for finding and accessing this information, not necessarily for the user, but mostly for the user's Web "browser". A browser is a program capable of submitting a request for information identified by an identifier, such as, for example, a URL. A user may enter a domain name through a graphical user interface (GUI) for the browser to access a source of content. The

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domain name is automatically converted to the Internet Protocol (IP) address by a domain name system (DNS), which is a service that translates the symbolic name entered by the user into an IP address by looking up the domain name in a database.

When viewing Web pages from different Web sites, a user may desire to print these documents, which include text and graphics. In some cases, the particular printer that a user desires to use may be unavailable.

Specifically, the printer may be offline or busy with other print jobs. For example, if the Web page contains color graphics and the user desires to have a color output, the user may select a printer with color capabilities. This printer may be located in a remote location on a network. If the printer is offline, the user will be unable to obtain a color output. In this instance, the user is required to return to the desired page and print that page at a later time when the printer is online. The unavailability of a printer also may occur with respect to a word processing document generated by a user or an e-mail message.

Therefore, it would be advantageous to have an improved method, apparatus, and computer instructions for handling the printing of documents.

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The present invention provides a method, apparatus, and computer instructions for managing a document. A request is received from a user at a remote data processing system to save a document for printing in which the request includes the document. The document is then stored in a repository in association with the user in response to receiving the request to form a stored document. The stored document is sent to a printer in response to a signal.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** is a pictorial representation of a network of data processing systems in which the present invention may be implemented;

**Figure 2** is a block diagram of a data processing system that may be implemented as a server in accordance with a preferred embodiment of the present invention;

**Figure 3** is a block diagram illustrating a data processing system in which the present invention may be implemented;

**Figure 4** is a diagram illustrating components used in managing the printing of items in accordance with a preferred embodiment of the present invention;

**Figures 5A-5C** are diagrams illustrating examples of records in accordance with a preferred embodiment of the present invention;

**Figure 6** is a diagram of a browser displayed in a data processing system in accordance with a preferred embodiment of the present invention;

**Figure 7** is a diagram of an access screen in accordance with a preferred embodiment of the present invention;

**Figure 8** is a flowchart of a process used for generating a record in accordance with a preferred

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embodiment of the present invention;

**Figure 9** is a flowchart of a process used for accessing a portable print queue in accordance with a preferred embodiment of the present invention;

5       **Figure 10** is a flowchart of a process used for storing records in a portable print queue in accordance with a preferred embodiment of the present invention; and

10       **Figure 11** is a flowchart of a process used for accessing and printing records in accordance with a preferred embodiment of the present invention.

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**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented.

5 Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers  
10 connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, server **104** is connected to network **102** along with storage unit **106**. In addition,  
15 clients **108**, **110**, and **112** are connected to network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients  
20 **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. In this example, network data processing system **100** also includes printers **114**, **116**, and **118**. Printer **114** is attached to server **104** while printer **118** is attached to client **108**. Printer **116** is a network printer directly  
25 connected to network **102** in this example. Network data processing system **100** may include additional servers, clients, and other devices not shown. The present invention may be implemented in network data processing system **100** to manage the printing of documents on  
30 printers, such as printers **114**, **116**, and **118**. Server **104**

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may serve as a portable print queue or a repository to store documents or other data to be printed in the event that a printer selected for printing a particular document is unavailable. This unavailability may be caused by the printer being offline or a printer queue being too long for a user to wait until the document is printed. The mechanism of the present invention allows a user at a client, such as client 112, to have data stored in a repository in server 104 for later printing. This mechanism will be described in more detail below.

In the depicted example, network data processing system 100 is the Internet with network 102 representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system 100 also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

Referring to **Figure 2**, a block diagram of a data processing system that may be implemented as a server, such as server 104 in **Figure 1**, is depicted in accordance with a preferred embodiment of the present invention. Data processing system 200 may be a symmetric multiprocessor (SMP) system including a plurality of processors 202 and 204 connected to system bus 206. Alternatively, a single processor system may be employed.



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Also connected to system bus 206 is memory controller/cache 208, which provides an interface to local memory 209. I/O bus bridge 210 is connected to system bus 206 and provides an interface to I/O bus 212. Memory controller/cache 208 and I/O bus bridge 210 may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge 214 connected to I/O bus 212 provides an interface to PCI local bus 216. A number of modems may be connected to PCI local bus 216. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to clients 108-112 in Figure 1 may be provided through modem 218 and network adapter 220 connected to PCI local bus 216 through add-in boards.

Additional PCI bus bridges 222 and 224 provide interfaces for additional PCI local buses 226 and 228, from which additional modems or network adapters may be supported. In this manner, data processing system 200 allows connections to multiple network computers. A memory-mapped graphics adapter 230 and hard disk 232 may also be connected to I/O bus 212 as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in Figure 2 may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in Figure 2 may be, for example, an IBM e-Server pSeries system, a

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product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system or LINUX operating system.

5           With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component  
10   interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI  
15   local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted  
20   example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics  
25   adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard  
30   disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three

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operating system may be a commercially available operating system, such as Windows 2000, which is available from Microsoft Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system 300. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive 326, and may be loaded into main memory 304 for execution by processor 302.

As another example, data processing system 300 may be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system 300 comprises some type of network communication interface. As a further example, data processing system 300 may be a personal digital assistant (PDA) device, which is configured with

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ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations. For example, data processing system **300** also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system **300** also may be a kiosk or a Web appliance.

The present invention provides a method, apparatus, and computer instructions for managing printing of items, such as word processing documents, e-mail messages, or Web pages, when a printer is unavailable. In these examples, a Web based repository on a distributed data processing system, such as network data processing system **100** is provided to store either "bookmarked" pages or entire documents and allow for the printing of these items at a later time.

Turning next to **Figure 4**, a diagram illustrating components used in managing the printing of items is depicted in accordance with a preferred embodiment of the present invention. In this example, a user using any desktop software may decide to print all or part of an item, such as a word processor document, an e-mail message, a Web page, or a spreadsheet. In this example, the software is browser **400** and the item is Web page **402**. If the user finds that printer **404** is unavailable because printer **404** is offline or the printer queue for printer **404** is too long for the user to wait to have the document printed, the user may mark or save Web page **402** using "save now print later" (SNPL) icon **406** in browser **400**. Manipulation of SNPL icon **406** activates print plug-in

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408, which generates record 410 and sends it to database manager 412. A plug-in is an auxiliary program that works with a software package or application to enhance its capability. For example, plug-ins are widely used in  
5 image editing programs to add a filter for some special effect. Plug-ins are added to Web browsers to enable them to support new types of content. In this example, print plug-in 408 is a plug-in for a GUI based program, such as a word processor or a Web browser. This plug-in provides  
10 an icon, such as SNPL 406 within browser 400. Print plug-in 408 provides a mechanism for connecting to a remotely based persistent storage, such as a database. Database manager 412 stores record 410 in portable print queue 414 within database 416. Portable print queue 414  
15 also is referred to as a "repository". Portable print queue 414 may be transferred to a client at which the user is located. Further, portable print queue 414 may be initially established locally at the client and transferred to database 416 by the user.

20 In this example, browser 400 and print plug-in 408 are located in a client, such as client 112 in Figure 1. Database manager 412 and database 416 are located in a server, such as server 104 in Figure 1. Printer 404 may be a printer, such as printer 114, printer 116, or  
25 printer 118 in Figure 1. Although database 416 is described as being located within server 104 in Figure 1, this repository may be located elsewhere such as storage unit 106 in Figure 1. Further, multiple databases in the same or different location also may be used depending on  
30 the particular implementation.

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At a later time, the user may access records within database 416 from browser 418, which is located in another data processing system, such as client 110 in **Figure 1**. In this example, browser 418 includes print plug-in 420, which provides SNPL icon 422. Access to these records is initiated through manipulation of SNPL icon 422 to generate request 424. Of course, the user could access these records from the same client through browser 400 depending on the location of the user. The user may send request 424 to database manager 412 to cause record 410 to be printed to printer 404. Request 424 causes record 410 to be retrieved from portable print queue 414 and sent to printer 404 for printing.

The access to these records may be controlled through presently available authentication mechanisms. Further, the mechanism of the present invention also allows for portable print queue 414 to be downloaded for local use. Depending on the particular implementation, portable print queue 414 may be located locally within the same client as the browser or other software being used by the user. In this case, the repository may be sent to database 416 when a connection is established by the print plug-in. This particular implementation allows for all records within the repository to be transferred to the database at one time reducing the number of connections established by the print plug-in.

With reference next to **Figures 5A-5C**, diagrams illustrating examples of records are depicted in accordance with a preferred embodiment of the present invention. A user may decide to store only a pointer to the data or save the data. By only saving a pointer, the

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amount of file space is reduced while actually saving the data prevents an inability to print the data later in the event that the data is moved or deleted from the location associated with the pointer.

5        In **Figure 5A**, record **500** contains the entire document or all of the data that is to be printed. In this example, the data or document is formatted as HTML document **502**. User information **504** is used to associate record **500** with the user when record **500** is stored within  
10 a portable print queue, such as portable print queue **414** in database **416** in **Figure 4**. Additionally, user information **504** also may include data for authenticating the user. In **Figure 5B**, record **506** contains user information **508** and path **510**. In this example, the  
15 record does not contain the data that is to be printed. Instead, a pointer to the data is employed. In **Figure 5C**, record **512** includes user information **514** and universal resource locator (URL) **516**. URL **516** serves as a pointer to the data in this particular example. When  
20 pointers are used, these pointers may be employed by the print plug-in or by the repository manager to retrieve the data for printing.

With respect to the format of data in a record, other information, such as date, time, file size, and  
25 location also may be stored within the record. This information may be stored in the form of information within an HTML file and include a link to the document, such as record **506** in **Figure 5B** and record **512** in **Figure 5C**. Alternatively, the HTML file may include the data to  
30 be printed, such as record **500** in **Figure 5A**. If the document is, for example, a Web page, the picture format

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files also may be stored in the record in addition to the text. For example, a Joint Photographic Experts Group (JPEG) image is stored in a record along with the association to its location with respect to the text.

- 5       Turning next to **Figure 6**, a diagram of a browser displayed in a data processing system is depicted in accordance with a preferred embodiment of the present invention. In this example, browser **600** displays Web page **602**, which includes text **604** and picture **606**.
- 10       Browser **600** may be, for example, browser **400** in **Figure 4**. If the user desires to print the document, the user may select print icon **608**. If, however, the printer is unavailable, the user may manipulate SNPL icon **610** to have Web page **602** stored as a record for printing at a
- 15       later time. In this example, the manipulation of SNPL icon **610** is a single click of a left mouse button. Of course, other types of user input may be used for this manipulation. The user may later then manipulate SNPL icon **610** with a different type of manipulation such as
- 20       the right click of a mouse button to access the record containing Web page **602**.

- With reference next to **Figure 7**, a diagram of an access screen is depicted in accordance with a preferred embodiment of the present invention. Access screen **700**
- 25       is an example of an access screen that may be presented to a user in response to manipulation of an SNPL button, such as SNPL button **610** in **Figure 6**. Access screen **700** is presented through a print plug-in, such as print plug-in **408** in **Figure 4**. Access screen **700** includes rows
- 30       **702**, **704**, and **706**. These rows represent records stored in a repository associated with the user. Each row may



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include a date, time, location, file format, and size. Rows 702 and 704 illustrate records in which pointers are stored while row 706 illustrates a record in which the actual data is stored. The location of the data is indicated as the repository, identifying that the data is actually stored at the repository. The user may now select one or more of the records in access screen 700 for printing.

Additionally, access screen 700 also includes printer section 708. In this portion of access screen 700, printers 710, 712, and 714 are displayed for selection by a user. The user may select a record, such as record 702, and have that record sent to one of these printers for printing.

In setting up a print plug-in, such as print plug-in 408 in Figure 4, the user may identify a location for the repository as being local or remote. If the portable print queue is to be remotely located, the user may enter a file transfer protocol (FTP) address of the server at which the portable print queue is to be located. Additionally, a user identification and a password also may be entered for authenticating access to the server.

With reference now to Figure 8, a flowchart of a process used for generating a record is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in Figure 8 may be implemented in a print plug-in, such as print plug-in 408 in Figure 4.

The process begins by receiving a print request (step 800). This print request is identified by a manipulation of a graphical image, such as SNPL icon 406

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in **Figure 4**. A record is generated from the document selected for printing (step **802**). These records may be formatted in the manner described in **Figures 5A-5C**. The record is sent to a database for storage in a portable print queue (step **804**) and the process terminates thereafter.

Turning now to **Figure 9**, a flowchart of a process used for accessing a portable print queue is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 9** may be implemented in a portable database manager, such as database manager **412** in **Figure 4**. This process may be implemented using presently available authentication mechanisms.

The process begins by receiving a user request to login to the repository (step **900**). The user is prompted for user identification and a password (step **902**). The user is authenticated (step **904**). A result is returned (step **906**) with the process terminating thereafter.

With reference now to **Figure 10**, a flowchart of a process used for storing records in a portable print queue is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 10** may be implemented in a database manager and a database, such as database manager **412** and database **416** in **Figure 4**. Of course, if the portable print queue is located locally, this process may be implemented by a print plug-in, such as print plug-in **408** in **Figure 4**. This local portable print queue may then be transferred to database manager **412** or some other client at a later time.

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The process begins by receiving a record (step 1000). In these examples, the record may be formatted in the manner described in **Figures 5A-5C**. The record is parsed for user information (step 1002). Next, a  
5 determination is made as to whether the user identified in the user information is authenticated (step 1004). If the user is authenticated, the record is stored in a portable print queue associated with the user (step 1006) and the process terminates thereafter.

10 Turning again to step 1004, if the user is not authenticated, an error is returned (step 1008) and the process terminates.

Turning now to **Figure 11**, a flowchart of a process used for accessing and printing records is depicted in  
15 accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 11** may be implemented in a print plug-in, such as print plug-in 408 in **Figure 4**. Records may be displayed and printed using a screen, such as access screen 700 in **Figure 7**.

20 The process begins by receiving a user input (step 1100). If the user input is a request for access to records, records associated with the user are identified (step 1102). Step 1102 may include searching a database for a portable print queue or repository associated with  
25 the user. Then, the identified records are presented to the user (step 1104) and the process returns to step 1100. These records may be presented to the user using access screen 700 in **Figure 7**.

If the user input is a request for available  
30 printers, printers associated with the user are identified (step 1106). The printers are presented (step

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1108) and the process returns to step 1100. These printers also may be presented using access screen 700 in Figure 7.

5 A user may select items, such as a record or a printer from the information presented in these examples. If the user input is one selecting one or more items, selected items are marked (step 1110) and the process returns to step 1100.

10 If the user input received in step 1100 is to print, a determination is made as to whether one or more records and a printer have been selected (step 1112). If the records and printer have been selected, the selected records are sent to the printer (step 1114) with the process returning to step 1100.

15 If the records and printer are not selected, an error is returned (step 1116) and the process returns to step 1100.

20 Thus, the present invention provides an improved method, apparatus, and computer instructions for managing printing of documents. The mechanism of the present invention is especially advantageous when a printer is unavailable because the printer is offline or the printer queue is too long for the user to wait. The mechanism allows the user to mark or save their document for  
25 printing at a later time. The document or a pointer to the document is placed into a record, which is saved in a portable print queue. This portable print queue may be accessed from any client connected to a network data processing system. This mechanism may be used for  
30 various applications, including a Web based e-mail system. In this type of implementation, added convenience is provided to the user as well as a central

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. In the depicted examples, the processes of the present invention are implemented in a plug-in. Depending on the particular implementation, the processes described with respect to the plug-in may be implemented in other forms, such as a separate application or as additional code added to a current application. The embodiment was chosen and described in order to best

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Depending on the particular implementation, the processes described with respect to the plug-in may be implemented in other forms, such as a separate application or as additional code added to a current application. The embodiment was chosen and described in order to best

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explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to  
5 the particular use contemplated.

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